

1 THE INVENTION IS CLAIMED AS:

SUB A1
1 1. A composite material comprising:
2 a matrix material; and
3 a plurality of particles in the matrix material, the particles ranging from about
4 40% by volume to about 85% by volume of the composite material.

2 2. The composite material of claim 1, wherein the plurality of particles
range from about 69% by volume to about 81% by volume of the composite material.

1 3. The composite material of claim 1, wherein the plurality of particles
2 comprise about 75% by volume of the composite material.

1 4. The composite material of any one of claims 1-3, wherein the plurality
2 of particles comprise at least a plurality of first particles and a plurality of second
3 particles having different sizes compared to each other.

SUB A2
1 5. The composite material of any one of claims 1-3, wherein the plurality
2 of particles are hollow microspheres.

2 6. The composite material of claim 5, wherein the hollow microspheres
comprises at least two different sized microspheres.

SUB A3
1 7. The composite material of any one of claims 1-3, wherein substantially
2 any given distance between adjacent microspheres is less than a diameter of the smallest
3 microsphere.

1 8. The composite material of any one of claims 1-3, wherein substantially
2 all of the plurality of particles are in contact with adjacent particles.

1 9. The composite material of any one of claims 1-3, wherein the particles
2 are selected from the group consisting of ceramic particles, glass particles, plastic
3 particles, and combinations thereof.

10. The composite material of any one of claims 1-3, wherein the matrix material is selected from group consisting of epoxies, polyesters, vinyl esters, phenolics, thermoplastics, thermosets, polyurethanes, glues, cements, matrix material binders, and combinations thereof.

11. The composite material of any one of claims 1-3, further comprising at least one layer of material in contact with the matrix material having the particles.

12.) The composite material of claim 11, wherein the at least one layer is selected from the group consisting of carbon fibers, glass fibers, uni-directional fibers, cross woven fibers, matte fibers, fiber braid, uni-directional stitch woven carbon fiber braid, plastics, leathers, foils, metals, laminates, composites, thermoplastics, thermoset materials, resins, ceramics, vinyls, rigid materials, flexible materials, flanking materials, and combinations thereof.

13. The composite material of any one of claims 1-3, wherein the composite material has a specific gravity of from about 0.38 to about 2.2.

14. The composite material of any one of claims 1-3, wherein the composite material has a specific gravity of less than 1.0.

15. A composite material comprising:
a matrix material from about 15% by volume to about 60% by volume; and
microspheres from about 40% by volume to about 85% by volume.

16. The composite material of claim 15, wherein the matrix material is from about 19% by volume to about 31% by volume, and the microspheres are from about 69% by volume to about 81% by volume.

17. The composite material of claim 16, wherein the matrix material is about 25% by volume, and the microspheres are about 75% by volume.

1 18. A composite material comprising a matrix binder material and
2 microspheres, the microspheres having a greater volume than the matrix binder material.

1 19. A composite material comprising:

2 a core having a matrix material from about 15% to about 60% by volume of the
3 core, and microspheres from about 40% to about 85% by volume of the core; and

4 a flanking layer bonded to the core.

1 20. The composite material of claim 19, wherein the core has flanking layers
2 bonded to opposite sides of the core.

1 21. The composite material of claim 19, wherein the flanking layer
2 substantially surrounds the core.

1 22. The composite material of claim 19, wherein the flanking layer is
2 selected from the group consisting of carbon fibers, glass fibers, uni-directional fibers,
3 cross woven fibers, matte fibers, fiber braid, uni-directional stitch woven carbon fiber
4 braid, plastics, leathers, foils, metals, composites, thermoplastics, thermoset materials,
5 resins, ceramics, vinyls, rigid materials, flexible materials, and combinations thereof.

1 23. A method of making a composite material comprising the steps of:

2 mixing particles in a matrix material until the matrix material is
3 substantially saturated with the particles;

4 forming the mixed matrix material and particles into a desired shape; and

5 curing the matrix material.

1 24. The method of claim 23, wherein the mixing step further comprises
2 forcing the particles towards each other under pressure.

1 25. The method of claim 24, further comprising the step of removing a
2 portion of the matrix material by passing the portion of the matrix material through a
3 filter while retaining the particles.

1 26. The method of claim 23, further comprising the step of bonding a
2 flanking layer to the mixed matrix material and particles.

1 27. The method of claim 26, wherein the flanking layer is bonded by curing
2 the matrix material.

1 28. A composite material comprising a matrix binder and microspheres or
2 particles, wherein said microspheres or particles comprise a greater weight percentage
3 of said composite material than said matrix binder.

1 29. A composite material comprising:
2 up to 50% by weight of a matrix binder; and
3 from about 50% or greater by weight microspheres or particles based upon the
4 total weight of said composite material.

1 30. A composite material comprising a matrix binder and microspheres or
2 particles, wherein said microspheres or particles comprise a lesser weight percentage of
3 said composite material than said matrix binder.

1 31. A composite material comprising:
2 up to 50% by weight microspheres or particles; and
3 from about 50% or greater by weight of a matrix binder based upon the total
4 weight of said composite material.

1 32. The composite material of claim 31, wherein said composite material
2 comprises from about 30% to about 45% by weight said microspheres or particles; and

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